

1. Record Nr.	UNINA9910816721703321
Autore	Giordano Arthur A (Arthur Anthony), <1941->
Titolo	Modeling of digital communication systems using Simulink / / Arthur A. Giordano & Allen H. Levesque
Pubbl/distr/stampa	Hoboken, New Jersey : , : Wiley, , [2015] [Piscataway, New Jersey] : , : IEEE Xplore, , [2015]
ISBN	1-119-00951-0 1-119-00952-9
Descrizione fisica	1 online resource (404 p.)
Altri autori (Persone)	LevesqueAllen H
Disciplina	621.3820285/53
Soggetti	Digital communications - Computer simulation
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Includes index.
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	-- Preface xiii -- Acknowledgments xix -- About the Companion website xxi -- Abbreviations and Acronyms xxiii -- 1 Getting Started with Simulink 1 -- 1.1 Introduction 1 -- 1.2 Starting a Matlab Session 2 -- 1.3 Simulink Block Libraries 3 -- 1.4 Building a New Simulink Model 6 -- 1.4.1 Inserting Signal Source and Scope 6 -- 1.4.2 Setting the Source Block Parameters 8 -- 1.4.3 Setting Scope Parameters 9 -- 1.5 Executing the Simulink Model 11 -- 1.6 Reconfiguring the Signal Block 14 -- 1.7 Sample-Based Signals 16 -- 1.8 Sending Data to Workspace 18 -- 1.9 Using Model Explorer 19 -- 1.10 Adding Labels to Figures 21 -- 1.11 Selecting Model Configuration Parameters 22 -- 1.12 Summary Discussion 24 -- Problems 25 -- 2 Sinusoidal Simulink Model 27 -- 2.1 A First Simulink Model 27 -- 2.2 Simulink Model of Sine Wave 27 -- 2.3 Spectrum of a Sine Wave 32 -- 2.4 Summary Discussion 40 -- Problems 41 -- 3 Digital Communications BER Performance in AWGN (BPSK and QPSK) 43 -- 3.1 BPSK and QPSK Error Rate Performance in AWGN 43 -- 3.2 Construction of a Simulink Model in Simple Steps 44 -- 3.3 Comparison of Simulated and Theoretical BER 56 -- 3.4 Alternate Simulink Model for BPSK 58 -- 3.5 Frame-Based Simulink Model 62 -- 3.6 QPSK Symbol Error Rate Performance 64 -- 3.7 BPSK Fixed Point Performance 68 -- 3.8 Summary Discussion 73 -- Appendix 3.A Theoretical BER Performance of BPSK in AWGN 73 -- Problems 75 -- 4 Digital Communications BER Performance in AWGN

(MPSK&QAM) 79 -- 4.1 MPSK and QAM Error Rate Performance in AWGN 79 -- 4.2 MPSK Simulink Model 79 -- 4.3 BER for Other Alphabet Sizes 83 -- 4.4 Fixed Point BER for MPSK 83 -- 4.5 QAM Simulink Model 85 -- 4.6 QAM BER for Other Alphabet Sizes Using Average Power 90 -- 4.7 QAM BER Using Peak Power 90 -- 4.8 Power Amplifier Constraint Using Peak Power Selection with QAM 91 -- 4.9 Summary Discussion 99 -- Problems 100 -- 5 Digital Communications BER Performance in AWGN (FSK and MSK) 101 -- 5.1 FSK and MSK Error Rate Performance in AWGN 101. 5.2 BFSK Simulink Model 101 -- 5.3 MFSK Simulink Model 107 -- 5.4 MSK Simulink Model 108 -- 5.5 MSK Power Spectrum 113 -- 5.6 Summary Discussion 116 -- Problems 117 -- 6 Digital Communications BER Performance in AWGN (BPSK in Fading) 119 -- 6.1 BPSK in Rayleigh and Rician Fading 119 -- 6.2 BPSK BER Performance in Rayleigh Fading 119 -- 6.3 BPSK BER Performance in Rician Fading 124 -- 6.4 BPSK BER Performance in Rician Fading with Multipath 127 -- 6.5 Summary Discussion 137 -- Appendix 6.A Theoretical BER Performance of BPSK in Rayleigh Fading 137 -- Appendix 6.B Theoretical BER Performance of BPSK in Rician Fading 138 -- Problems 139 -- 7 Digital Communications BER Performance in AWGN (FSK in Fading) 141 -- 7.1 FSK in Rayleigh and Rician Fading 141 -- 7.2 BFSK BER Performance in Rayleigh Fading 141 -- 7.3 MFSK BER Performance in Rayleigh Fading 142 -- 7.4 BFSK BER Performance in Rician Fading 147 -- 7.5 BFSK BER Performance in Rician Fading with Multipath 148 -- 7.6 Summary Discussion 150 -- Appendix 7.A Theoretical BER Performance of FSK in Rayleigh and Rician Fading 152 -- Rayleigh Fading 152 -- Rician Fading 153 -- Problems 154 -- 8 Digital Communications BER Performance (STBC) 157 -- 8.1 Digital Modulations in Rayleigh Fading with STBC 157 -- 8.2 BPSK BER in Rayleigh Fading with STBC 157 -- 8.3 QAM BER in Rayleigh Fading with STBC 163 -- 8.4 Summary Discussion 163 -- Appendix 8.A Space / Time Block Coding for BPSK 165 -- Appendix 8.B Space / Time Block Coding for 16-QAM 167 -- Problems 169 -- 9 Digital Communications BER Performance in AWGN (Block Coding) 171 -- 9.1 Digital Communications with Block Coding in AWGN 171 -- 9.2 BER Performance of BPSK in AWGN with a Binary BCH Block Code 171 -- 9.3 BER Performance of BPSK in AWGN with a Hamming Code 175 -- 9.4 BER Performance of BPSK in AWGN with a Golay(24,12) Block Code 179 -- 9.5 BER Performance of FSK in AWGN with Reed-Solomon Code 181 -- 9.6 BER Performance of QAM in AWGN with Reed-Solomon Coding 186 -- 9.7 Summary Discussion 190. Problems 192 -- 10 Digital Communications BER Performance in AWGN (Block Coding and Fading) 193 -- 10.1 Digital Communications with Block Coding in Fading 193 -- 10.2 BER Performance of BPSK in Rayleigh Fading with Interleaving and a BCH Block Code 194 -- 10.3 BER Performance of BFSK in Rayleigh Fading with Interleaving and a Golay(24,12) Block Code 195 -- 10.4 BER Performance of 32-FSK in Rayleigh Fading with Interleaving and a Reed-Solomon(31,15) Block Code 201 -- 10.5 BER Performance of 16-QAM in Rayleigh Fading with Interleaving and a Reed-Solomon(15,7) Block Code 204 -- 10.6 BER Performance of 16-QAM in Rayleigh and Rician Fading with Interleaving and a Reed-Solomon(15,7) Block Code 208 -- 10.7 BER Performance of BPSK in Rayleigh Fading with Interleaving and a BCH Block Code and Alamouti STBC 210 -- 10.8 BER Performance of BFSK in Rayleigh Fading with Interleaving and a Golay(24,12) Block Code and Alamouti STBC 215 -- 10.9 BER Performance of 32-FSK in Rayleigh Fading with Interleaving and a Reed-Solomon(31,15) Block Code and Alamouti STBC 218 -- 10.10 BER Performance of 16-QAM in Rayleigh Fading with

Interleaving and a Reed-Solomon (15,7) Block Code and Alamouti STBC 219 -- 10.11 Summary Discussion 223 -- Problems 224 -- 11 Digital Communications BER Performance in AWGN and Fading (Convolutional Coding) 225 -- 11.1 Digital Communications with Convolutional Coding in AWGN and Fading 225 -- 11.2 BER Performance of Convolutional Coding and BPSK in AWGN 226 -- 11.2.1 Hard-Decision Decoding 226 -- 11.2.2 Soft-Decision Decoding 229 -- 11.3 BER Performance of Convolutional Coding and BPSK in AWGN and Rayleigh Fading with Interleaving (Soft- and Hard-Decision Decoding) 233 -- 11.4 BER Performance of Convolutional Coding and BPSK and Alamouti STBC in Rayleigh Fading with Interleaving 239 -- 11.5 Summary Discussion 243 -- Problems 244 -- 12 Adaptive Equalization in Digital Communications 247 -- 12.1 Adaptive Equalization 247 -- 12.2 BER Performance of BPSK in Dispersive Multipath Channel Using an LMS Linear Equalizer 248. 12.3 BER Performance of BPSK in Dispersive Multipath Channel Using an LMS Linear Equalizer From the Simulink Library 257 -- 12.4 BER Performance of QPSK in a channel with ISI Using an LMS Linear Equalizer 258 -- 12.5 BER Performance of BPSK in Dispersive Multipath Channel Using a Decision Feedback Equalizer 268 -- 12.6 BER Performance of BPSK in Rayleigh Fading Multipath Channel Using an RLS Equalizer 273 -- 12.6.1 RLS Equalizer Description 273 -- 12.6.2 RLS Equalization in Rayleigh Fading with No Multipath 275 -- 12.6.3 RLS Equalization in Rayleigh Fading with Multipath 279 -- 12.7 Summary Discussion 280 -- Problems 283 -- 13 Simulink Examples 285 -- 13.1 Linear Predictive Coding (LPC) for Speech Compression 286 -- 13.1.1 Speech Vocal Tract Model 289 -- 13.1.2 Prediction Coefficients Computation 289 -- 13.1.3 Speech Analysis and Synthesis 289 -- 13.2 RLS Interference Cancellation 291 -- 13.2.1 Sinusoidal Interference 291 -- 13.2.2 Low Pass Filtered Gaussian Noise 296 -- 13.3 Spread Spectrum 298 -- 13.3.1 Spread Spectrum Simulink Model without In-Band Interference 298 -- 13.3.2 Spread Spectrum Simulink Model with In-Band Interference 303 -- 13.3.3 Spread Spectrum Simulink Model with In-Band Interference and Excision 309 -- 13.4 Antenna Nulling 313 -- 13.5 Kalman Filtering 320 -- 13.5.1 Scalar Kalman Filter 322 -- 13.5.2 Kalman Equalizer 328 -- 13.5.3 Radar Tracking Using Extended Kalman Filter (EKF) 339 -- 13.6 Orthogonal Frequency Division Multiplexing 343 -- 13.7 Turbo Coding with BPSK 355 -- Appendix A Principal Simulink Blocks Used In Chapters 1 / 13 363 -- Appendix B Further Reading 369 -- Index 371.

Sommario/riassunto

A comprehensive and detailed treatment of the program SIMULINK(R) that focuses on SIMULINK(R) for simulations in Digital and Wireless Communications Modeling of Digital Communication Systems Using SIMULINK(R) introduces the reader to SIMULINK(R), an extension of the widely-used MATLAB modeling tool, and the use of SIMULINK(R) in modeling and simulating digital communication systems, including wireless communication systems. Readers will learn to model a wide selection of digital communications techniques and evaluate their performance for many important channel conditions. Modeling of Digital Communication Systems Using SIMULINK(R) is organized in two parts. The first addresses address Simulink(R) models of digital communications systems using various modulation, coding, channel conditions and receiver processing techniques. The second part provides a collection of examples, including speech coding, interference cancellation, spread spectrum, adaptive signal processing, Kalman filtering and modulation and coding techniques currently implemented in 4G wireless systems. . Covers case examples, progressing from basic to complex. Provides applications for 4G mobile

communications, satellite communications, and fixed wireless systems that reveal the power of SIMULINK modeling. Includes access to useable SIMULINK(R) simulations online Covering both the use of SIMULINK(R) in digital communications and the complex aspects of wireless communication systems, Modeling of Digital Communication Systems Using SIMULINK(R) is a great resource for both practicing engineers and students with MATLAB experience. Arthur Giordano, PhD, is a consultant in the field of military and commercial communications specializing in wireless communications. He is a co-founder of G5 Scientific, LLC, is a senior member of the IEEE and has taught graduate communications courses. He has developed numerous models using MathWorks(R)' SIMULINK(R) to characterize digital communications systems. Allen Levesque, PhD, / is a consultant specializing in digital communications systems, and is a partner in G5 Scientific, LLC. He has taught graduate courses in digital communications at Worcester Polytechnic Institute and is currently a Research Scientist in WPI's Center for Wireless Information Network Studies. Dr. Levesque is an elected Fellow of the IEEE. / .
